


# BUZ11
# BUZ11FI

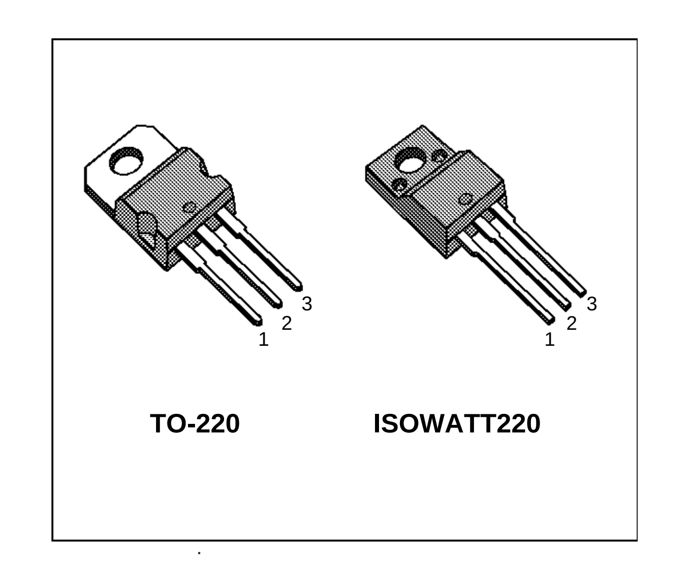
## N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

| TYPE | $V_{DSS}$ | $R_{DS(on)}$ | $I_D$ |
|---|---|---|---|
| BUZ11 | 50 V | < 0.04 Ω | 36 A |
| BUZ11FI | 50 V | < 0.04 Ω | 21 A |

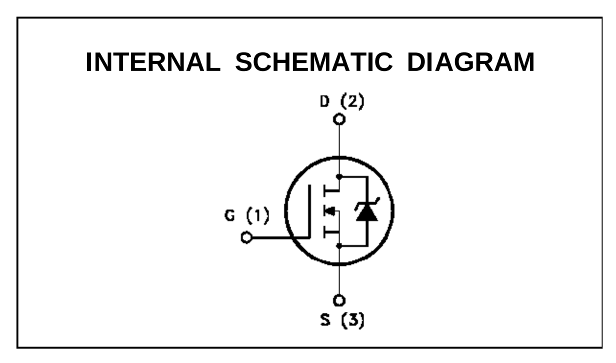
- TYPICAL $R_{DS(on)}$ = 0.03 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100$^o$C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175$^o$C OPERATING TEMPERATURE

### APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)




### INTERNAL SCHEMATIC DIAGRAM




### ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | | Unit |
|---|---|---|---|---|
| | | BUZ11 | BUZ11FI | |
| $V_{DS}$ | Drain-source Voltage ($V_{GS}$ = 0) | 50 | | V |
| $V_{DGR}$ | Drain- gate Voltage ($R_{GS}$ = 20 kΩ) | 50 | | V |
| $V_{GS}$ | Gate-source Voltage | ± 20 | | V |
| $I_D$ | Drain Current (continuous) at $T_c$ = 25 $^o$C | 36 | 21 | A |
| $I_{DM}$ | Drain Current (pulsed) | 144 | 144 | A |
| $P_{tot}$ | Total Dissipation at $T_c$ = 25 $^o$C | 120 | 40 | W |
| $V_{ISO}$ | Insulation Withstand Voltage (DC) | — | 2000 | V |
| $T_{stg}$ | Storage Temperature | -65 to 175 | | $^o$C |
| $T_j$ | Max. Operating Junction Temperature | 175 | | $^o$C |
| | DIN Humidity Category (DIN 40040) | E | | |
| | IEC Climatic Category (DIN IEC 68-1) | 55/150/56 | | |

## THERMAL DATA

| | | | TO-220 | ISOWATT220 | |
|---|---|---|---|---|---|
| $R_{thj\text{-}case}$ | Thermal Resistance Junction-case | Max | 1.25 | 3.75 | $^oC/W$ |
| $R_{thj\text{-}amb}$ | Thermal Resistance Junction-ambient | Max | 62.5 | | $^oC/W$ |

## AVALANCHE CHARACTERISTICS

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $I_{AR}$ | Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by $T_j$ max, $\delta < 1\%$) | 36 | A |
| $E_{AS}$ | Single Pulse Avalanche Energy (starting $T_j = 25\ ^oC$, $I_D = I_{AR}$, $V_{DD} = 25$ V) | 240 | mJ |
| $E_{AR}$ | Repetitive Avalanche Energy (pulse width limited by $T_j$ max, $\delta < 1\%$) | 60 | mJ |
| $I_{AR}$ | Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100\ ^oC$, pulse width limited by $T_j$ max, $\delta < 1\%$) | 25 | A |

## ELECTRICAL CHARACTERISTICS ($T_{case} = 25\ ^oC$ unless otherwise specified)

OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-source Breakdown Voltage | $I_D = 250\ \mu A$ $V_{GS} = 0$ | 50 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current ($V_{GS} = 0$) | $V_{DS}$ = Max Rating<br>$V_{DS}$ = Max Rating $T_j = 125\ ^oC$ | | | 250<br>1000 | μA<br>μA |
| $I_{GSS}$ | Gate-body Leakage Current ($V_{DS} = 0$) | $V_{GS} = \pm 20$ V | | | ± 100 | nA |

ON (∗)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}$ $I_D = 1$ mA | 2.1 | 3 | 4 | V |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS} = 10V$ $I_D = 18$ A | | 0.03 | 0.04 | Ω |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $g_{fs}$ (∗) | Forward Transconductance | $V_{DS} = 15$ V $I_D = 18$ A | 10 | 16 | | S |
| $C_{iss}$<br>$C_{oss}$<br>$C_{rss}$ | Input Capacitance<br>Output Capacitance<br>Reverse Transfer Capacitance | $V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$ | | 1130<br>480<br>140 | 1500<br>650<br>200 | pF<br>pF<br>pF |

SWITCHING

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_{d(on)}$<br>$t_r$<br>$t_{d(off)}$<br>$t_f$ | Turn-on Time<br>Rise Time<br>Turn-off Delay Time<br>Fall Time | $V_{DD} = 30$ V $I_D = 3$ A<br>$R_{GS} = 50\ \Omega$ $V_{GS} = 10$ V | | 40<br>145<br>220<br>135 | 60<br>210<br>320<br>200 | ns<br>ns<br>ns<br>ns |





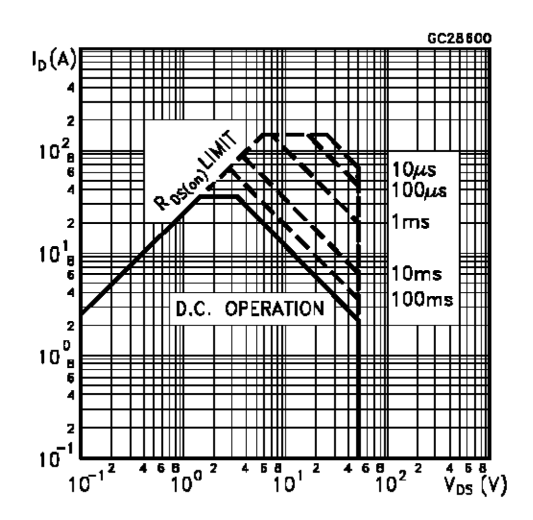
**ELECTRICAL CHARACTERISTICS** (continued)

SOURCE DRAIN DIODE

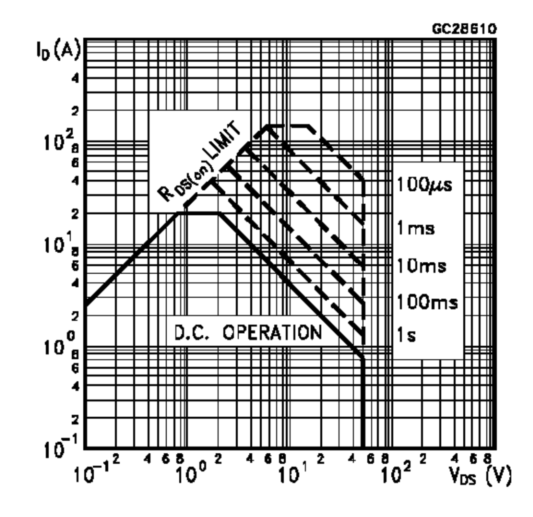
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{SD}$<br>$I_{SDM}$ | Source-drain Current<br>Source-drain Current (pulsed) | | | | 36<br>144 | A<br>A |
| $V_{SD}$ (∗) | Forward On Voltage | $I_{SD}$ = 72 A $V_{GS}$ = 0 | | | 2.2 | V |
| $t_{rr}$<br><br>$Q_{rr}$ | Reverse Recovery Time<br>Reverse Recovery Charge | $I_{SD}$ = 36 A di/dt = 100 A/μs<br>$V_{DD}$ = 30 V $T_j$ = 150 °C | | 90<br><br>0.2 | | ns<br><br>μC |

(∗) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %

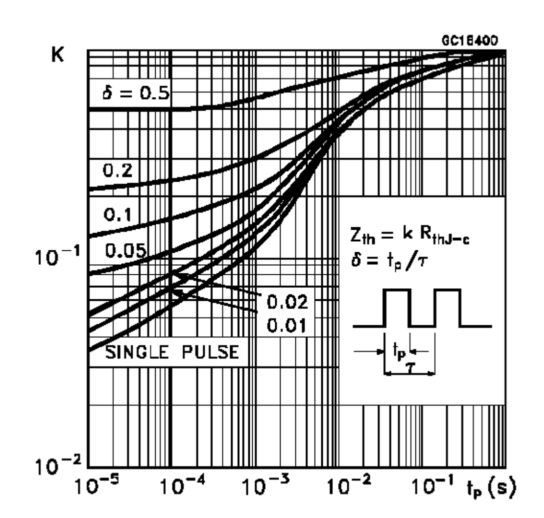
Safe Operating Area For TO-220



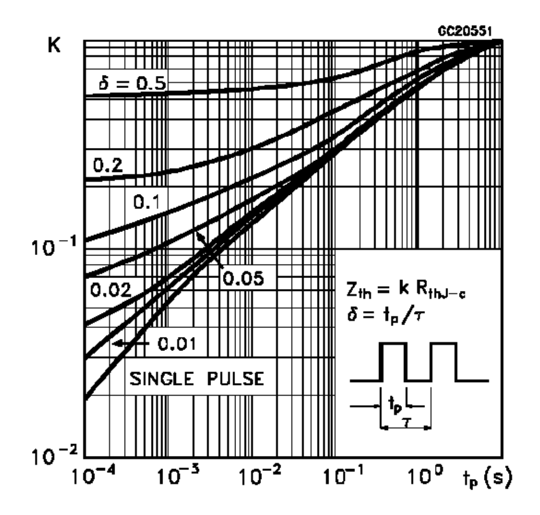

Safe Operating Area For ISOWATT220



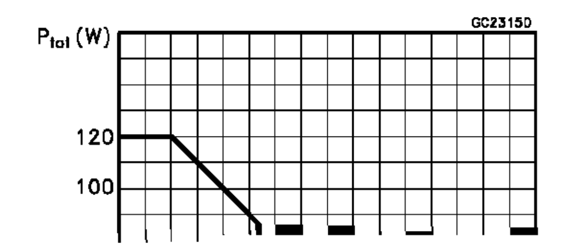

Thermal Impedance For TO-220



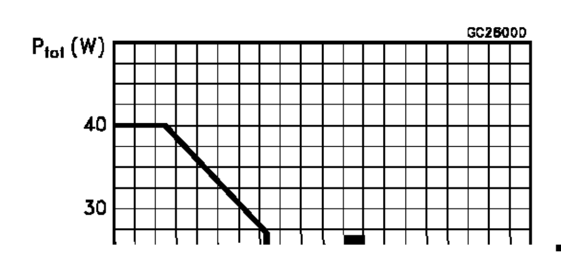

Thermal Impedance For ISOWATT220



Derating Curve For TO-220




Derating Curve For ISOWATT220



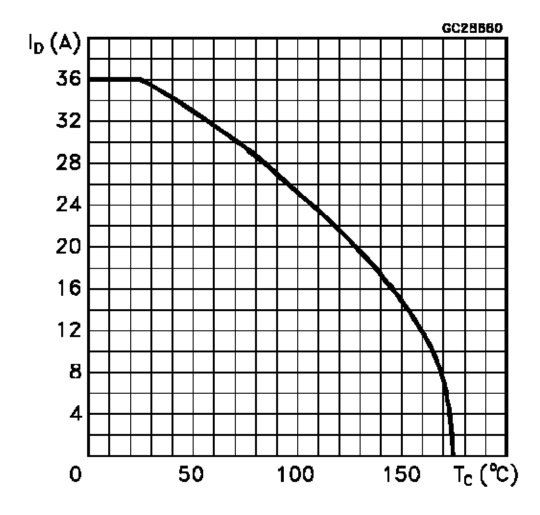

Output Characteristics

Transfer Characteristics

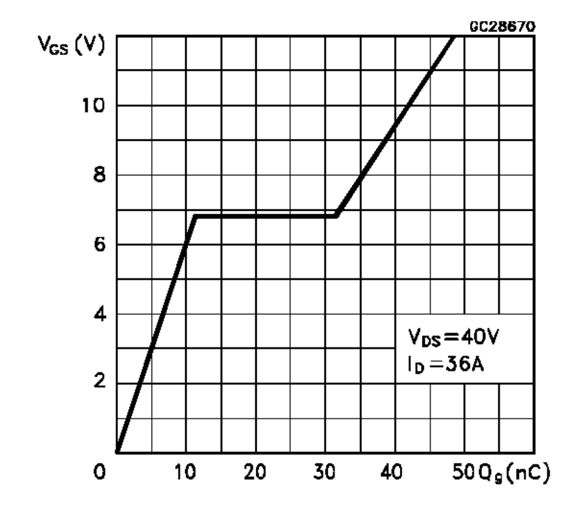
Transconductance

Static Drain-Source On Resistance

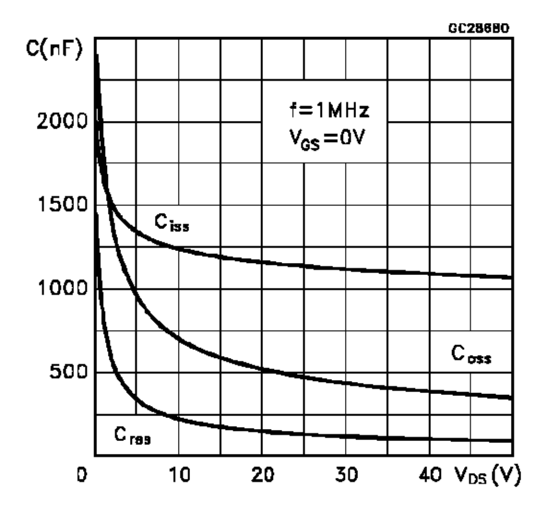
Maximum Drain Current vs Temperature



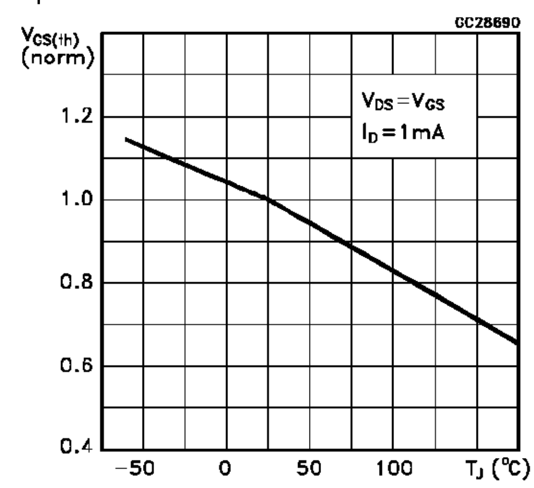

Gate Charge vs Gate-Source Voltage



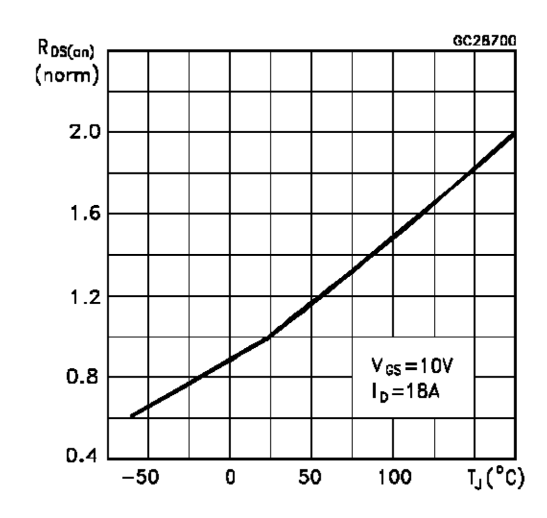

Capacitance Variation



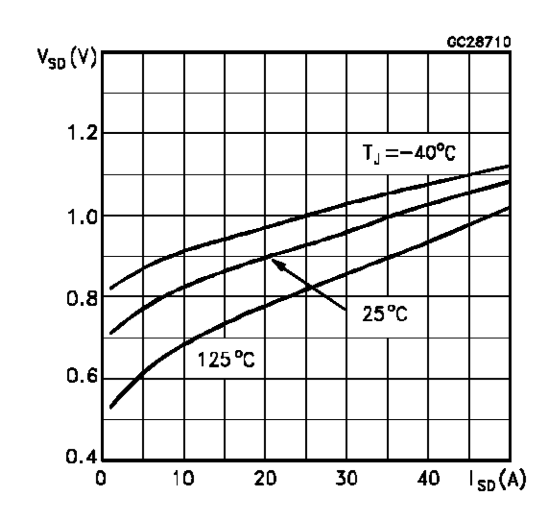

Normalized Gate Threshold Voltage vs Temperature




Normalized On Resistance vs Temperature

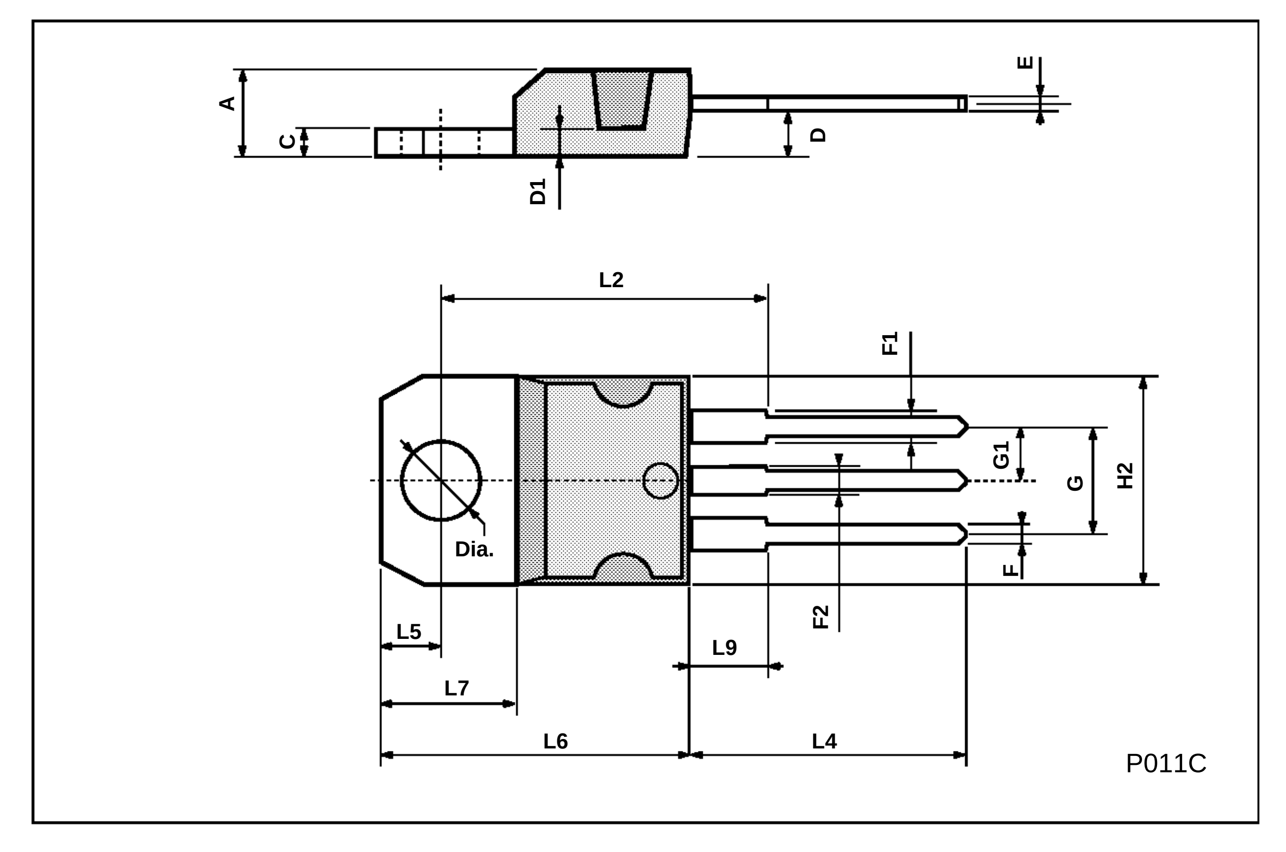



Source-Drain Diode Forward Characteristics



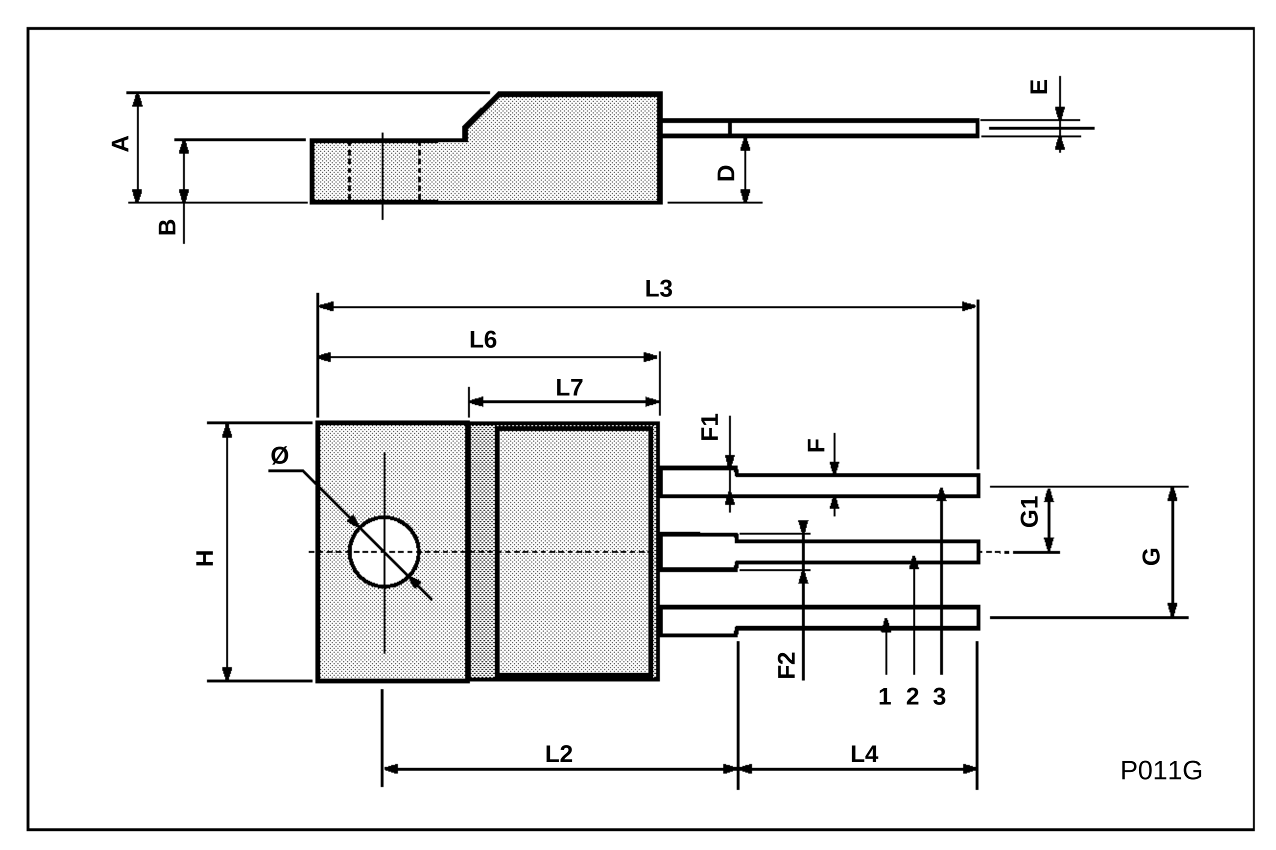
## TO-220 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| C | 1.23 | | 1.32 | 0.048 | | 0.051 |
| D | 2.40 | | 2.72 | 0.094 | | 0.107 |
| D1 | | 1.27 | | | 0.050 | |
| E | 0.49 | | 0.70 | 0.019 | | 0.027 |
| F | 0.61 | | 0.88 | 0.024 | | 0.034 |
| F1 | 1.14 | | 1.70 | 0.044 | | 0.067 |
| F2 | 1.14 | | 1.70 | 0.044 | | 0.067 |
| G | 4.95 | | 5.15 | 0.194 | | 0.203 |
| G1 | 2.4 | | 2.7 | 0.094 | | 0.106 |
| H2 | 10.0 | | 10.40 | 0.393 | | 0.409 |
| L2 | | 16.4 | | | 0.645 | |
| L4 | 13.0 | | 14.0 | 0.511 | | 0.551 |
| L5 | 2.65 | | 2.95 | 0.104 | | 0.116 |
| L6 | 15.25 | | 15.75 | 0.600 | | 0.620 |
| L7 | 6.2 | | 6.6 | 0.244 | | 0.260 |
| L9 | 3.5 | | 3.93 | 0.137 | | 0.154 |
| DIA. | 3.75 | | 3.85 | 0.147 | | 0.151 |



# ISOWATT220 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.4 | | 4.6 | 0.173 | | 0.181 |
| B | 2.5 | | 2.7 | 0.098 | | 0.106 |
| D | 2.5 | | 2.75 | 0.098 | | 0.108 |
| E | 0.4 | | 0.7 | 0.015 | | 0.027 |
| F | 0.75 | | 1 | 0.030 | | 0.039 |
| F1 | 1.15 | | 1.7 | 0.045 | | 0.067 |
| F2 | 1.15 | | 1.7 | 0.045 | | 0.067 |
| G | 4.95 | | 5.2 | 0.195 | | 0.204 |
| G1 | 2.4 | | 2.7 | 0.094 | | 0.106 |
| H | 10 | | 10.4 | 0.393 | | 0.409 |
| L2 | | 16 | | | 0.630 | |
| L3 | 28.6 | | 30.6 | 1.126 | | 1.204 |
| L4 | 9.8 | | 10.6 | 0.385 | | 0.417 |
| L6 | 15.9 | | 16.4 | 0.626 | | 0.645 |
| L7 | 9 | | 9.3 | 0.354 | | 0.366 |
| Ø | 3 | | 3.2 | 0.118 | | 0.126 |




SGS-THOMSON
MICROELECTRONICS